THE VALUE OF GREEN RESIDENTIAL HOMES

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Abstract

This paper shall examine green/sustainable residential single family homes and address the question of what is the value of a green residential home product.

The idea and theory behind green construction is widely accepted as being the "thing to do" in our new environmentally conscience society. There are an increasing amount of green residential homes being constructed throughout the mid-atlantic area and around the country. These green housing products offers consumers energy savings and environmental responsibility. They also offer builders a chance to charge a premium price to offset the added costs of building green. Despite what seems like a win-win situation for all there has not been a conclusion as to whether a green home delivers all that is promised for either the builder or the homeowner.

The goal of this proposed paper shall be to examine if a green residential home can deliver on its lofty ideals as well as deliver value as compared to non-green homes at this time of its evolution.

The history of the green/sustainable housing movement will be discussed. Included in this discussion will be the growth of sustainable living from a grassroots effort in the 1970's to its eventual acceptance at the state and local level with green housing programs. The total single family home market will be compared with single family green portion of that market.

The growth of sustainable housing has fostered the implementation of national green rating systems. This paper will discuss the three biggest national rating systems, Energy Star, Leed for Homes, and NAHB. Each of these three systems will be detailed

with similarities and differences amongst them. Also, the financial implications and costs will be dealt with.

With growth, good and bad issues will materialize. This paper will address some of those issues. First the reasons to change to a sustainable living and to a green house will be discussed. Then the warts and problems with the construction, materials, costs, and health issues of building green will be analyzed.

The green housing market is not in a vacuum. As such, the housing market will be examined. Both a national and a regional history and present outlook will be studied. Along with this will be a review of the demographics of Arlington County, Virginia, the main area of my study.

The paper will then compare and analyze newly built single family homes that are certified green in Arlington with comparable newly built non-green single family homes. Price, dollars per square foot, and days on the market difference are some of the metrics that will be used for this comparison.

This paper will then examine the results of two other studies done in Atlanta and in the State of Washington in both the Portland and Seattle metropolitan areas.

Lastly, a conclusion will be reached addressing whether presently newly built green single family residential homes have value.

HISTORY OF GREEN RESIDENTIAL

Green residential construction can have a different meaning to various proponents, practitioners and consumers. A house can be deemed green with a minimal amount of sustainable practices or it can utilize a wide array of green features and have a minimal environmental impact (Fischer, 2009). According to the U.S. Green Building Council (USGBC), a house can be a green residential home if it is a home that uses less energy, water and natural resources, creates less waste, and is more durable and comfortable for occupants ("LEED for Homes," n.d.). The home should reduce the impact on human health and the environment. Environmentally-preferable and sustainable decisions should be used when constructing a green home all the way through the building process. The goal is to have a home that minimizes the environmental impact while being built and throughout its sustainable life according to the United States Environmental Protection Agency (EPA) and the United States Department of Energy (DOE) ("A Green Home," n.d.).

While the meaning of green or sustainable housing causes some debate, there is very little debate that the overall concept of green residential building is relatively new. The idea can be traced back to a grassroots effort started because of an energy crisis in the 1970's (Winter, 2007). The reality of limited energy resources was the genesis that brought about a change in the way people started to think differently about many things including housing. The evolution of this green/sustainable thought process was sped up considerably by the recent newsworthy events of greenhouse gases and global warming.

THE VALUE OF GREEN RESIDENTIAL HOMES

The refocus on environmentalism is at its greatest peak since the energy crisis of the 1970's. This has led to a tremendous up-tick in environmentally friendly or sustainable construction practices as well as energy efficient housing. Where the idea of green residential homes was previously only seen as a niche market, the green residential movement has picked up considerably with the media's focus on global warming, organic living, and the environment. Green building practices is definitely one of the ways that the landscape of America is changing.

The grassroots effort which brought about the green building movement brought about green housing support programs as well. For the most part the substantive effort to promote the spread of green building is occurring at state and local levels with volunteers (Winter, 2007).

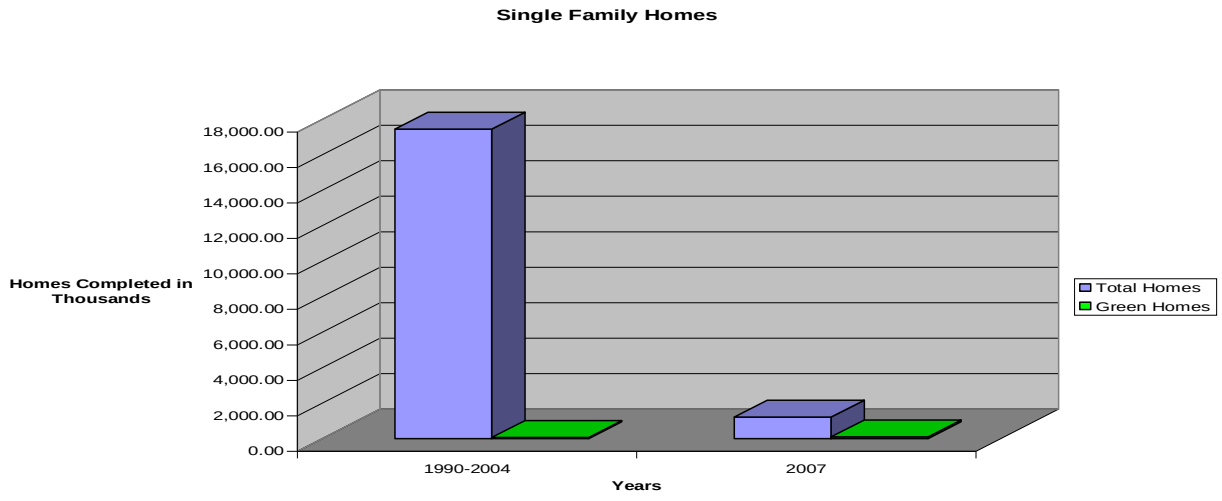
The first official housing support program for green residential housing in the United States was established in 1991 in Austin, Texas with the Austin Energy Green Building Program. By the year 2000, the Austin program was certifying over 700 homes per year. This program is successful, award winning, and stringent.

The program has been so successful that on its website the Austin Energy Green Building Program proudly names itself" "America's #1 Green Building Program" (Austin Energy, n.d.). The website also lists the numerous awards garnered by the program. Additionally, the program has a rigorous five star/level rating system which rates a project by the sustainability and the resource and energy efficiency of new and remodeled buildings.

THE VALUE OF GREEN RESIDENTIAL HOMES

Since the inception of the Austin program the number of green building programs continues to increase each year. Currently, there are well over 90 such local or regional programs in the U.S. with at least 17 of these statewide programs.

Between 1990 and 2004 green building programs certified an estimated 61,000 new green residences as estimated by the National Association of Home Builders (NAHB). In 2007, NAHB conducted a survey that found that over 97,000 green homes had been built and certified by green building programs around the country. This represents a 50% increase in the amount green residential homes being built in only three years (Smart Market Report, 2008). Despite this dramatic increase green housing is not a major portion of the new construction market. Putting this in perspective, the total amount of new single family residential homes built in the United States between 2004 and 2007 was 4.2 million. This is less than one percent of the total single family homes built during this period. Even in a down economy, there were 91,000 new single family homes built in the fourth quarter of 2009 alone.



THE VALUE OF GREEN RESIDENTIAL HOMES

In 2007, green homes increased to almost 8% of the total single family homes built. Also, the residential green market was estimated to be about 6% to 10% of the residential construction market at the end of 2008. This represents a residential green construction value of between $12 billion and $20 billion. In the next five years, the residential green building market is expected to double to an estimate of 12% to 20% of the residential construction market.

Despite this tremendous increase in a short time, green residential development growth has, what seems to be, a long road to be on par with conventional home building.

NATIONAL GREEN RATING SYSTEMS

Local and regional green home building programs use and incorporate in one form or another one or more of the three well known and widely used nationwide green residential ratings systems. The rating systems are ENERGY STAR, Leadership in Energy and Environmental Design (LEED) and National Association of Home Builders (NAHB) National Green Building Program. All three ratings systems are valid measures of sustainable development, but each reflect a different mix of environmental values and each will have a different cost impact. Accordingly, an overview of the three ratings system must be done. Thereafter, the costs associated with each will be addressed.

ENERGY STAR

ENERGY STAR is a joint program of EPA and the DOE. In 1992 ENERGY STAR was introduced as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. In 1995 the program was expanded to include new homes (About ENERGY STAR, n.d.).

ENERGY STAR is the most successful of the three programs. More than 1 million ENERGY STAR homes have been built in the United States since the program first began labeling homes in 1995. Further, local and regional building standards often use ENERGY STAR as the base of their platforms (Winter, 2007).

To earn the ENERGY STAR designation, a home must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. These homes are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20–30% more efficient than standard homes (Features of ENERGY STAR, n.d.). Any home three stories or less can earn the ENERGY STAR label. This includes single family, attached, and low-rise multi-family homes as well as manufactured homes, systems-built homes (e.g., SIP, ICF, or modular construction), log homes, concrete homes, and even existing retrofitted homes.

A home must have third party verification by a certified Home Energy Rater (HER) to ensure that the home meets ENERGY STAR guidelines prior to receiving the ENERGY STAR label (Features of ENERGY STAR, n.d.). Homes can achieve the ENERGY STAR designation through a combination of energy efficient improvements which include effective insulation systems, high–performance windows, tight construction and ducts, efficient heating and cooling equipment and ENERGY STAR qualified lighting and appliances.

After a determination that all requirements have been met, the Rater will then complete the final inspection. Thereafter, the Rater will provide the builder with an ENERGY STAR label, which is placed on the circuit breaker box of the home. This

label provides the homeowner with documentation that the home is ENERGY STAR qualified (Features of ENERGY STAR, n.d.).

NAHB National Green Building Program

In 2004 the NAHB wrote the NAHB Model Green Home Building Guidelines. The Guidelines was published a year later as a voluntary program covering seven areas, including lot preparation and design, resource efficiency, energy efficiency, water efficiency and conservation, occupancy comfort and indoor environmental quality, and operation, maintenance and homeowner education (History of NAHB, n.d.).

In 2007, the NAHB partnered with the International Code Council (ICC) to establish a nationally recognized standard of green building. The result was the National Green Building Standard (NGBS) which was launched in 2008. The NGBS is in compliance with the requirements of the American National Standards Institute (ANSI). The NGBS includes single and multifamily homes, residential remodeling projects and site development projects while allowing for the flexibility required to select regionally-appropriate best green practices (History of NAHB, n.d.).

There are similarities between NGBS and the NAHB Model Green Homebuilding Guidelines. In particular builders or developers must incorporate a minimum number of features in the areas of energy, water, and resource efficiency, lot and site development, indoor environmental quality, and home owner education. Nevertheless, NGBS has more mandatory items and recommends that higher thresholds be met in several categories (National Green, n.d.). Moreover, to qualify for "Bronze" under NGBS a

home must be at least 15% better than ENERGY STAR (National Green, n.d.). Beyond this, a new fourth threshold, entitled “Emerald”, was added to designate the highest achievement in residential green construction.

LEED for Homes

> “To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life (About USGBC, n.d.).”

This is the mission statement of the U.S. Green Building Council, the creator of LEED. LEED was established by USGBC as a way to define and measure green buildings. Just like ENERGY STAR and NGBS, LEED is a voluntary building rating system. LEED was launched by USGBC in 1998 and has many various separate rating systems for different building categories such as new commercial construction, existing buildings, schools, residential homes and others. This paper will only cover the residential rating system, LEED for Homes.

LEED for Homes is the residential branch of LEED and was commenced two years ago in 2008. It targets the top 25% of new homes with green and environmentally friendly features (LEED for Homes, n.d.). This is a conscience effort by LEED for Homes to brand itself as the top and most recognizable national home rating system.

LEED for Homes has eight different categories to rate a home. Projects are graded by Innovation & Design Process; Location & Linkages; Sustainable Sites; Water Efficiency; Energy & Atmosphere; Materials & Resources; Indoor Environmental Quality; and Awareness & Education. Likewise to NGBS, LEED for Homes has four certification levels (Certified, Silver, Gold and Platinum) (LEED for Homes, n.d.). Furthermore, it has a third party verification system similar to those of ENERGY STAR and NGBS.

COSTS OF GREEN RESIDENTIAL DEVELOPMENT

Despite the benefits of new, more efficient green homes, potential home buyers are unwilling to pay much of a premium for a green home, according to a NAHB 2008 survey. Thus, one of the primary concerns of builders regarding green building is its profitability.

Homebuilders run a business and they operate on a profit motive. This is not to say that other concerns are not important to builders, but if they cannot make a profit they will not stay in business. Builders are worried that the additional costs associated with green building will limit their ability to recover those costs from customers. Another primary concern that builders expressed was changing building practices to participate in green building programs.

There are additional costs to construct and certify a green home such as registration and certification fees from the local housing program as well as the national rating system. These fees vary but usually start from as low as a few hundred dollars to substantially higher and differ based on the project and location. Not included in these fees are the costs for the Green Rater verification which are based on market prices in whatever region the home is located.

The homebuyer's and the general public's perspective on green building is similar to the builders in that they both seem to think that green building is the correct but homebuyers seem to want to do the right thing at little or no extra cost.

To a certain extent, the homebuilder and the homebuyer are accurate. Green residential development can raise costs of new construction from as little as 2% to as much as 25-30% for a complete green design build (Kenneth Wenhold, personal

communication, November 5, 2009). Nevertheless, studies have shown that the costs of sustainable residential development can be limited in most circumstances to between 2% and 6% (Morris, 2007). The varying cost for incorporating sustainable design elements will depend greatly on a wide range of factors, including building type, project location, local climate, site conditions, and the familiarity of the project team with sustainable design. Indeed, more education for both the homebuilder and the homebuyer can alleviate most of their cost concerns that would seem to address the concerns of both.

THE CHANGE TO RESIDENTIAL GREEN - GREEN PROS AND CONS

There are a number of reasons for the increase in sustainable housing. Green homes are energy efficient, save money, provide healthy indoor environments, and reduce impacts on the environment. Furthermore, there is a desire for the U.S. homeowners to have environmentally friendly and efficient homes.

Buildings account for nearly 40% of total energy consumed, and 72% of U.S. consumption of electricity overall according to the U.S. Department of Energy's Energy Information Administration. Residential homes account for over 20% of the of the nation's energy use and 21% of carbon emissions. Moreover, the DOE reports U.S. residential energy use has grown by 34% since 1985. However, increases in energy consumption are mitigated by voluntary programs, such as ENERGY STAR appliances, homes, and buildings, as well as "green" building programs and designations such as LEED for Homes.

Tax credits for energy efficient homes, energy efficient mortgages and lower operating costs due to lower energy expenditures help prospective homeowners and builders shift to residential green homes.

Additionally, buildings are a major part of climate change by discharging carbon dioxide into the atmosphere through the use of electricity generated by the burning of non-renewable fossil fuels, or by burning carbon-based fuels within the building. In this manner, buildings account for 30% of greenhouse gas emissions. This represents a significant, if mostly invisible, health risk as the average American spends 90% of his or her time indoors.

Of equal importance is that interest in the environment and sustainability has grown and is now in the mainstream of the American consciousness. A 2008 global consumer study reported that 49 percent of U.S. consumers surveyed were more concerned about the environment than five years ago (Curry, 2008). Thirty-six percent of those surveyed had changed their behavior recently to benefit the environment. Lastly, a 2007 study found that 36.4 percent of potential home buyers identified energy savings, health benefits, or the environment as their primary decision-making factor in their next home purchase.

As a result, the increase in residential sustainable housing should continue for at least the very near future.

THE PROBLEMS OF GREEN

Conventional wisdom says that green building is slowly becoming more main-stream and homebuyer demand for green homes are increasing. America is changing to a more focused approach to green issues and so is its home construction industry but

this is not necessarily a good thing at this point in time. Green residential construction has its problems that need to be worked out before the philosophy can be truly embraced by the general population. It is costly, the energy saving performance levels, despite being highly touted, has yet to be tested on any major scale. Also, the construction is still new and unreliable in both materials and implementation and even if done right there is a significant risk of mold and indoor air pollution.

There is little debate that a newly built green/sustainable home costs more than a newly built conventional home. The real dispute is to the reality as to what it actually costs. One Northern Virginia builder estimated that if a HVAC is upgraded one level it will take a homebuyer 10 years to pay for the expensive upgrade (Amir, A&N contractors, personal communication, March 27, 2010). Add to this the fact that maintenance on some green features can be much higher than conventional homes and you can see why builders will not go green without evidence that there is value to them to cover the expense. Other builders have found different ways to go “green” at significantly less costs.

For instance, Community Development Corporation of Utah (CDCU) builds energy efficient homes for about $3,000 - $5,000 of extra construction costs. CDCU’s upgrades include high performance envelopes and upgraded mechanical equipment (Building America, CDC, 2008). While Rural Development, Inc., a home builder in Massachusetts, will be constructing 20 green homes which will costs approximately $3,000 for the upgrades in windows, heating, plumbing, insulation, ventilation, and appliances (Building America, RDI, 2008).

This divergence is an example of the problem of costs. Builders' opinions vary widely with their building practices and on their code compliance structure. Costs are not universal and the perceptions of what "green" construction costs will continue to take extremes and middle grounds until green building practices are more commonly used and are standardized.

Green building programs and ratings systems focus on the design and construction of a green project. There is very little focus on the actual energy saving performance levels of a green building. Energy savings are assumed to be a given. The assumption is that actual performance of a green building will be better than a normal building. As a result, few assessments of energy saving performance of green buildings have been done (Fischer, 2009). Thus, there is no certainty that a certified green building will be considerably better or worse in energy savings performance versus a conventional building.

One study of energy use by over 100 LEED certified buildings found that the LEED certified buildings performed well over the national average (Fischer, 2009). Its findings included the fact that the average improvement in energy use was 24% over the national average. This can lead to the conclusion that the study appears to support the thinking that there is substantial energy savings in the performance of green buildings. Nevertheless, one in seven buildings performed worse than the national average. Of equal importance, this study was characterized as misleading and has raised doubts as to whether the green certified buildings actually consume less energy than similar conventional buildings on average (Fischer, 2009).

Currently, there is no consensus as to specific goals or measurement metrics of the performance of green/sustainable homes or the materials used to make them. Add to this, the difficulty of collecting reliable and consistent data. Put these together and you have the current situation of very little comparisons of known energy savings of green building. Hence, while the measurement of the actual energy saving performance of green buildings should be a critical tool in any real progress for green construction, at this point it is not clear when actual energy savings will be a vital component for green development.

A further reason for the problems of green homes is that the materials used in the construction process are still in an early stage. The construction industry is a historically conservative industry. It has relied on proven materials and methods (Odom, Scott & DuBose, 2009). However, because of the great increase in demand, new products are entering the green construction market are at increasing rate. This can lead contractors to depart from tried and true age old products like concrete, metal, wood and stone since the newer materials can earn green certification. This departure comes with new perils.

One risk is that many of these new materials are not time-tested. If a new product fails the reason for the failure may be difficult to ascertain. It could be a design error, an installation error, or a product defect (Odom et al., 2009). This will inevitably lead to lawsuits because of the buildings failure.

The chart below lists some of the differences between green building practices vs. normal construction:

Green Buildings vs. Lower Risk Buildings

Green Buildings	Lower Risk Buildings
*Adds additional o*utside air (>ASHRAE by 30+ %)	*Minimizes* outside air (Does not exceed ASHRAE guidelines)
Emphasize energy conservation	Emphasize dehumidification
Stress VOC reduction –Emphasizes exhaust (>5 Paschals) –Building flush out	Minimizes VOC concern –Very tight control of exhaust –Rejects building flush out
Stress new, innovative materials	Stress proven materials
Stresses carbohydrate based materials	Stresses hydrocarbon based materials
Stresses extra envelope thermal insulation	Stresses drying potential of envelope (walls and roof)

Source (Odom, Scott & DuBose, 2009).

As the chart depicts, some of the newer materials are carbohydrate based versus the time tested hydrocarbon based found in lower risk buildings. The performance levels and the long term stability are unproven for some of these carbohydrate based materials (Odom et al., 2009). This too can lead to litigation.

Another risk of green building practices is the risk to the health of the inhabitants of the buildings. The improved energy efficiency of green homes and building can lead to poor indoor air quality. Contractors may use recycled green products that contain and emit harmful VOC's. This is done because the emphasis of green construction is the environment and not the actual users of the products (Disadvantages of green building, n.d.). Mold growth and increased humidity levels can also be byproducts of green building practices and newer materials (Odom et al., 2009).

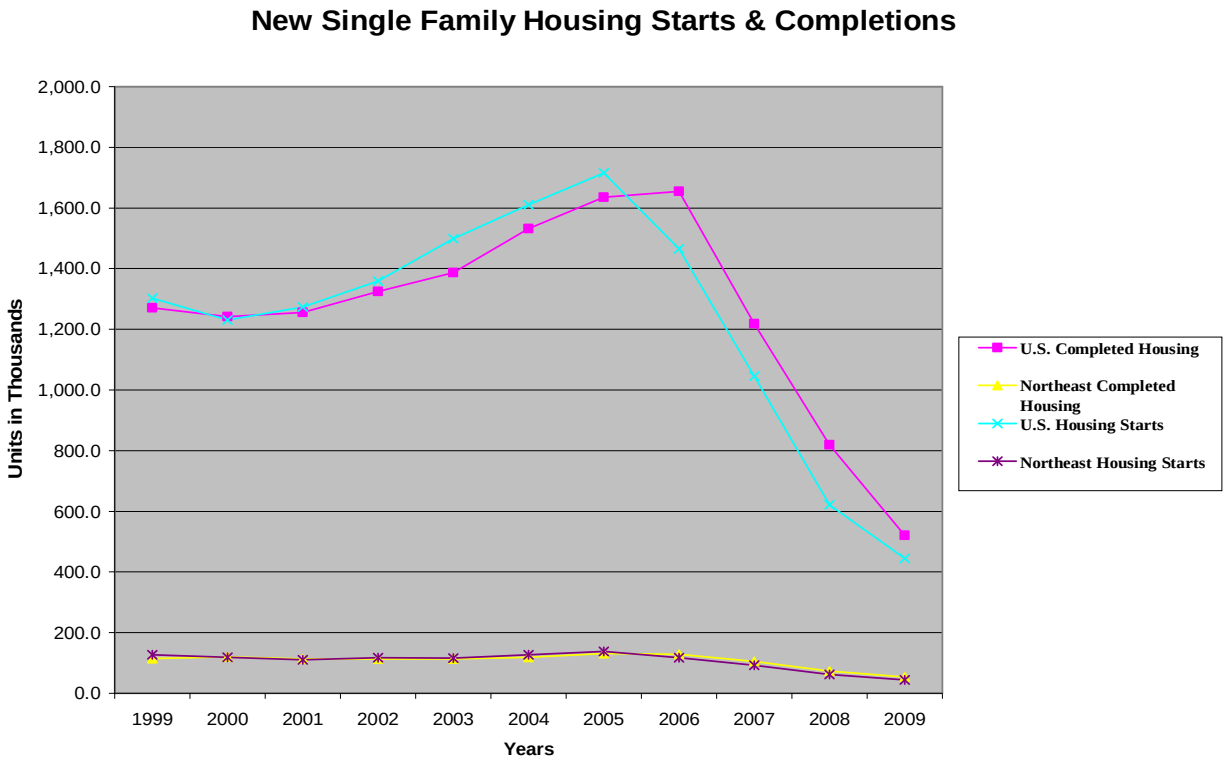
Regardless of the progress and growth of green buildings, litigation, building failure, unacceptable energy efficient performance levels will ultimately cause costs to rise and may kill the movement if changes are not made quickly and comprehensively.

HOUSING MARKET

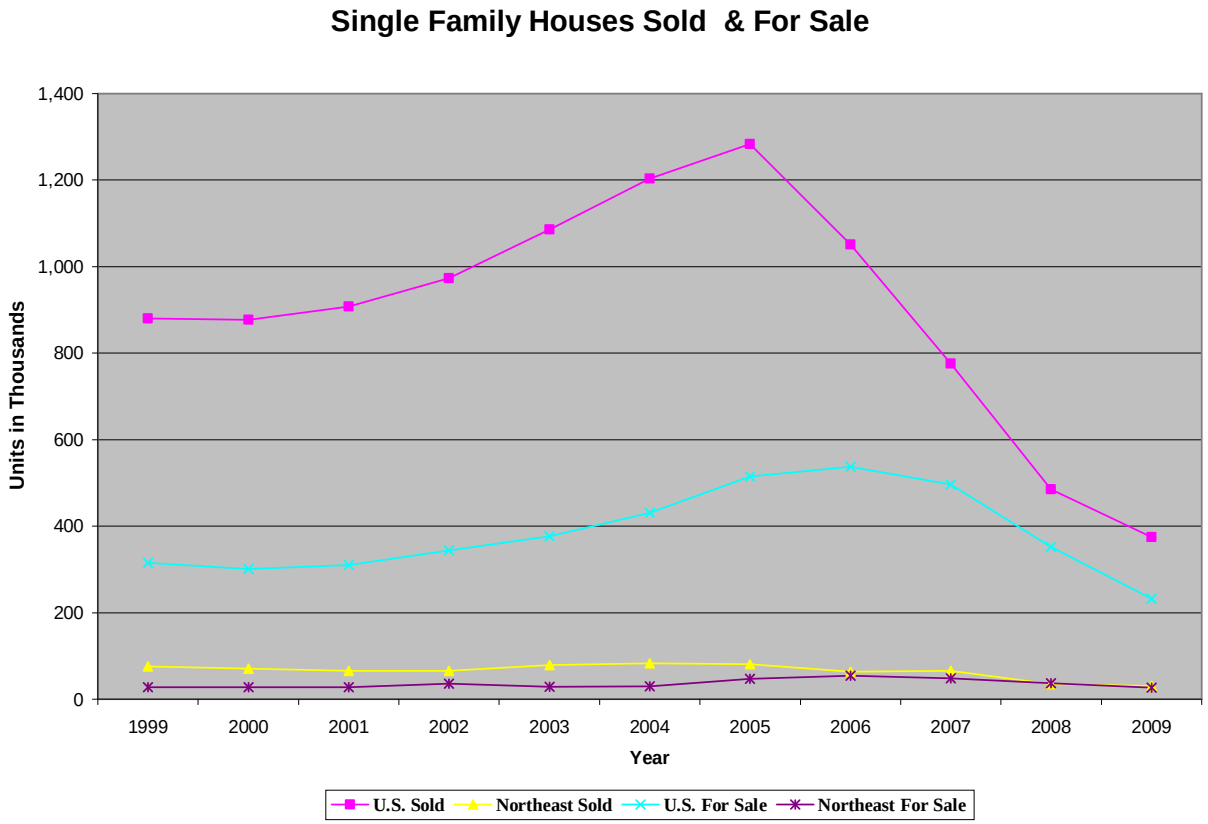
It would be incomplete to discuss the value of residential buildings without addressing the broader housing market. Since the housing market peaked in 2006, the nation has suffered through nearly half a decade of financial and economic hell. The center of this financial turmoil is the housing market. It has been well documented that the sub-prime mortgages and mortgage backed securities, primarily residential (RMBS), as well as the decrease in value of homes have led this country to a recession. Consequently, the historically down housing market can be and most likely is a cause for the lack of green or for that matter conventional housing starts and sales.

The chart below depicts Census data which shows that single family home construction starts and completions reached a high point in the latter stages of 2005. Thereafter, there was a dramatic fall of both construction starts and completions. Nationwide starts and completions have decreased by over two thirds within three years.

However, the housing market for the Northeast (including Virginia) has not been as bleak during this same time period. There has been a downturn in the Northeast market but, as the chart shows, there is no great fall of the cliff. Rather the Northeast housing market has shown a gradual decline and currently there is a flattening out of the market. Construction starts and completions the Northeast housing market has been more stable during the period of review. This would seem to make a case for a stronger Northeast housing market for development of single family houses than the nation as a whole.



The next chart gives more strength to the argument that the Northeast housing market is stronger and was not as greatly affected by the downward spiral of the housing market.



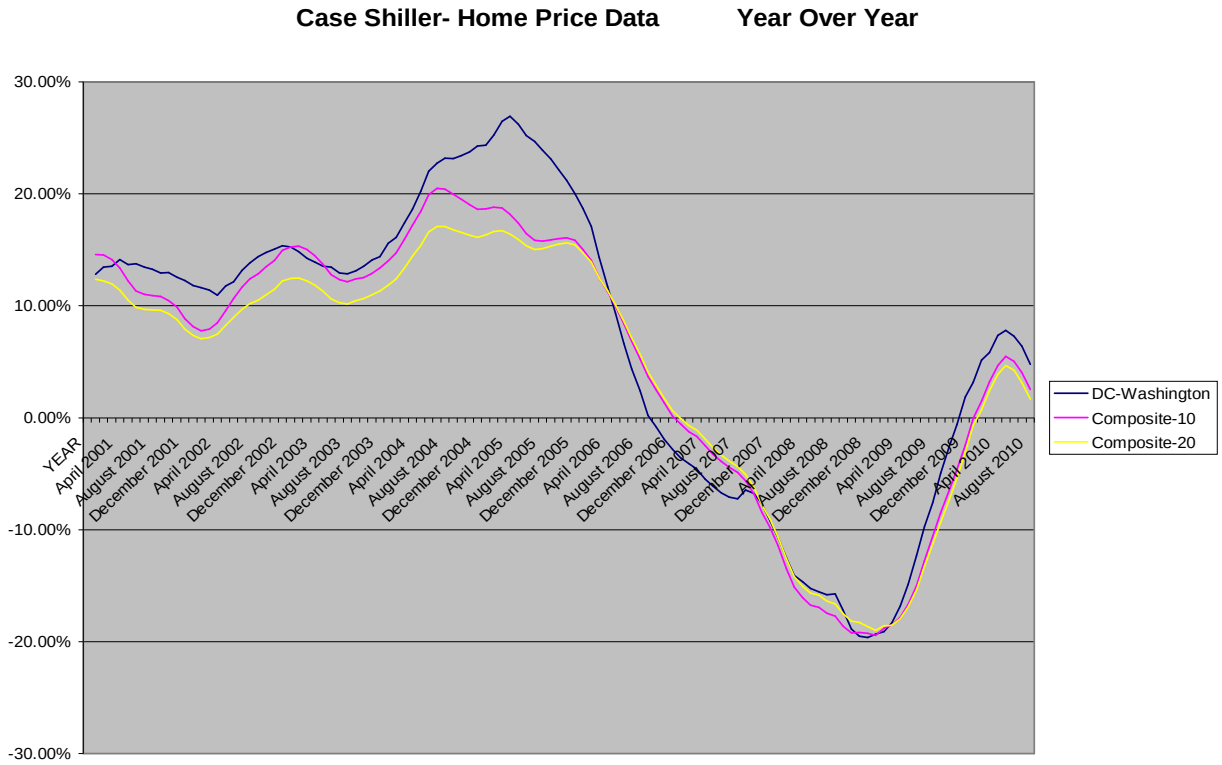
Nationally sales of single family units peaked in 2005 with almost 1.3 millions sold. This figure has dropped appreciably to under 400,000 units for the 2009 year. Similarly to the national housing starts and completions decline, this is a decline of two thirds of the market since 2005. However, over a ten year period, which coincides with the initial stages of the housing boom, this drop is only a little over half of the total.

Although it seems that the sales of single family residences are leveling out at the end of this ten year period, it must be noted that these numbers are not without government help. The period does include the Federal Government's historic first-time homeowner tax credit, implemented in 2009. This was a critical factor which led to the first annual increase of new home sales in 47 months during 2009. Nonetheless, this

was a temporary fix because when the tax credit ended, also ending was any increase in home sales.

The chart also shows that the Northeast sold and for sale housing market, as with housing starts and completions, was not as substantially affected by the recession. Moreover, while there is still a gap in between the total houses sold and for sale in the U.S. there is a minimal difference between total houses sold and houses for sale in the Northeast. This signifies a much better than average house selling market in the Northeast.

The last aspect of the housing market that will be addressed in this paper is pricing. Pricing can either generate sales or keep potential homebuyers away. The chart below contains data reported by the Case-Shiller Index, Composite -10, Composite – 20 and the Washington DC area.



When comparing the Washington DC metropolitan area to the other nationwide metropolitan area composites, the DC area has historically had a greater year over year price appreciation than the nationwide areas. Despite the fact that in 2005 the DC market was considerably greater year over year than the other composites, the DC area housing prices losses year over year are in line with the composites in 2009. This chart shows that when prices are good or increase, the DC market is better than the nation as a whole but when prices drop, DC falls in step with the nation.

When combining the three aspects of the housing market (starts and completions, sales and for sale and pricing) analyzed in this section of the conclusion must be reached that the Washington DC metropolitan area (which includes Arlington County) has survived this economic downturn better than the nation.

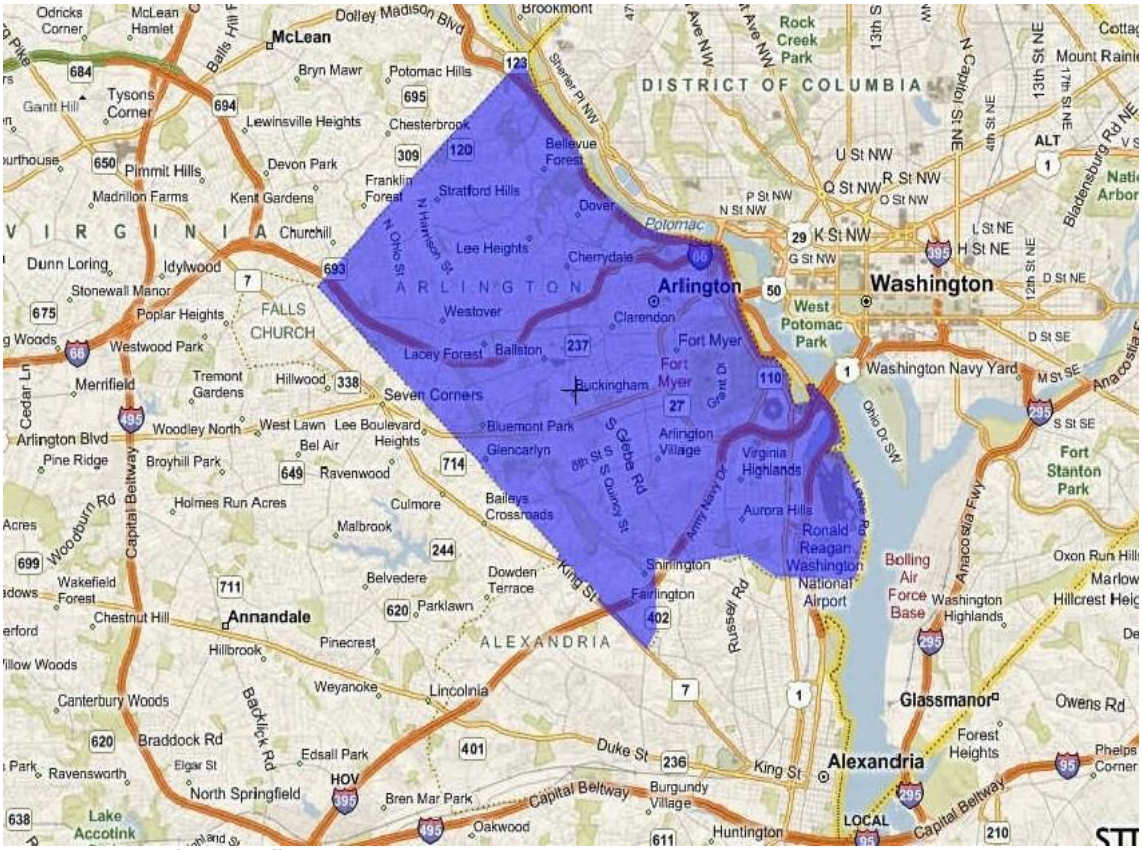
GEOGRAPHIC STUDY AREA

One of the issues with studying green development is the lack of tracking of the sale or rental of sustainable housing. That is why Arlington County was chosen as the area to examine. Arlington County, through its' green building program, is one of the few areas in the United States that keep easily verifiable records of green home certification and sales. At the time of this research, Arlington County was the only known program in the Baltimore-Washington DC area that kept such easily verifiable and traceable records of recently built sustainable residential single family.

However, the National Association of Realtors (NAR) and the Multiple Listing Service (MLS) have recently implemented changes to MLS. There are now data entry fields to identify green features and certifications of for sale and sold properties in at least nine states. These features will help real estate agents search for sustainable homes and properties, and it will allow builders and sellers to market their green endeavors. Hopefully this new change will eventually take hold around the entire nation.

ARLINGTON COUNTY, VIRGINIA

The county of Arlington was established March 13, 1847 as Alexandria County. This county was originally part of the area surveyed for Washington D.C. however, the portion on the west bank of the Potomac River was returned to the Commonwealth of Virginia by the U.S. Congress on July 9 1846. The entire area was known as Alexandria City and Alexandria County until March 16, 1920 when the county portion was renamed Arlington County.


McLean
Tysons Corner
Pimmit Hills
Falls Church
Arlington
Washington
Alexandria
Annandale
Seven Corners
Ballston
Clarendon
Rosslyn
Pentagon
Crystal City
Potomac
DISTRICT OF COLUMBIA
VIRGINIA
ARLINGTON
ALEXANDRIA
Reagan National Airport
Fort Myer
Glassmanor
Huntington
Lincolnia
Baileys Crossroads
Culmore
Bailey's Crossroads
Fairlington
Shirlington
Virginia Highlands
Aurora Hills
Arlington Village
Bluemont Park
Westover
Lee Heights
Cherrydale
Lacey Forest
Buckingham
Hillwood
Woodley North
Lee Boulevard Heights
Bel Air
Glencarlyn
Ravenwood
Belvedere
Dowden Terrace
Parklawn
Pinecrest
Hillbrook
Weyanoke
Braddock Rd
Edsall Park
North Springfield
Bren Mar Park
Oakwood
Burgundy Village
Forest Heights
Old Town
Capital Beltway
Duke St
King St
Russell Rd
Glebe Rd
Quincy St
Army Navy Dr
Ohio Dr SW
Anacostia Fwy
Rock Creek Park
West Potomac Park
Fort Stanton Park
Washington Navy Yard
Bolling Air Force Base
Washington Highlands
Oxon Run Hills
Hillcrest Heights
Owens Rd
Phelps Corner
Mount Rainier
Bladensburg Rd NE
Dolley Madison Blvd
Gantt Hill
Dunn Loring
Idylwood
Stonewall Manor
Poplar Heights
Westwood Park
Merrifield
Tremont Gardens
Arlington Blvd
Pine Ridge
Broyhill Park
Holmes Run Acres
Malbrook
Wakefield Forest
Chestnut Hill
Canterbury Woods
Ravensworth
Lake Accotink
Madrillon Farms
Kent Gardens
Devon Park
Franklin Forest
Stratford Hills
Dover
Bellevue Forest
Chesterbrook
Lewinsville Heights
Potomac Hills
Bryn Mawr
Odricks Corner
McLean Hamlet
Balls Hill
Cedar Ln
Woodburn Rd
Backlick Rd
Capital Beltway
N Ohio St
N Harrison St
Sherier Pl NW
Brookmont
Rock Creek Park
13th St NE
4th St NE
Cottage
ALT
U St NW
R St NW
Q St NW
P St NW
N St NW
K St NW
G St NW
H St NE
L St NE
D St NE
M St SE
S St SE
12th St NE
Ave NW
Ave NW
Ave NW

Arlington County, Virginia	
2010 Population	
Total Population	215,842
Median Age	36.4
Race and Ethnicity	
White	70.3%
Black	7.3%
Hispanic	17.8%
2010 Income	
Median HH Income	$84,453
Per Capita Income	$47,808
Average HH Income	$105,630
2010 Households	
Total Households	97,019
Average Household Size	2.18
2010 Housing	
Owner Occupied Housing Units	38.3%
Renter Occupied Housing Units	53.80%
Vacant Housing Units	7.90%
Source: U.S. Bureau of the Census, ESRI and STDBonline.	

Additionally, Arlington residents are among the most highly educated in the nation. In 2008, about 70% of adults age 25 and older had a bachelor's degree or higher and almost 37% had a graduate or professional degree. In March 2010, Arlington's unemployment rate was 4.8%.

Housing prices in Arlington are significantly better than the nation as a whole. The average assessed value of a home in the county is $508,966 in the year 2010. Compare this to the 2009 U.S. median single family home price of $216,700 or the 2009 U.S. average single family home price of $270,900. This demonstrates that Arlington is far and away a better than average U.S. housing market.

This does not insulate Arlington from the national problems of the housing market. Notwithstanding, the fact that the county has a high home assessment, there was a negative trend in housing value assessments between 2009 and 2010.

AVERAGE ASSESSED VALUE (2010) - $508,966
Single-Family Detached House $646,436
Single-Family Attached House, Townhouse $620,573
Condominium Townhouse $509,332
Condos $351,468
Cooperatives $149,764
Percent change in average assessment (2009 - 2010) -3.25%

Source: Arlington County Department of Real Estate Assessments.

In 2003, Arlington County Virginia developed a local green residential building program entitled the Arlington Green Home Choice Program (AGHCP). The AGHCP was developed to provide structure and support to builders and homeowners who want to build green homes in Arlington County, Virginia. This program is a voluntary program that provides building guidelines and techniques for local builders and homeowners who want to go green. Among the advantages of AGHCP is that it offers participants front-of-the-line plan review, lawn signs indicating participation in the program and attendance at County-sponsored seminars along with a green builder designation.

AGHCP is based on the Earthcraft House program, a green home rating system designed by the Southface Institute in Atlanta, Georgia. Although the AGHCP is based on the Earthcraft House program, AGHCP lists ENERGY STAR as a mandatory requirement for new home construction (Arlington Green Home, 2010).

This paper will analyze homes in Arlington County that have been certified by AGHCP. These homes will be compared to other recently built homes that have similar bedroom/bathroom amenities as the new built green houses. The comparable non-green homes will be close in geographical proximity as well as reasonably close in square footage. Lastly, sale dates will be relatively close in time between the green homes and non-green comparable homes used for this comparison.

Below is a listing of the homes used for that were used for this study:

Green Home(s)	Sq. Ft.	Bdrms/Baths/½ Bath	Comparable Non-Green Home(s)	Home Sq. Ft.	Lot Size	Bdrms/Baths/½ Bath	Sq. Ft. Differential	Sq. Ft. Percent Change
4215 15th Street North	4,890	5/4/1	1822 Taylor Strret North	4,470	8,000	5/4/1	420	8.59%
			4357 Lee Highway	4,888	5,177	5/4/1	2	0.04%
			1736 Quebec Street North	4,576	6,791	5/4/1	314	6.42%
1107 N. Utah Street	2,430	4/3/1	5650 8th Rd North	2,603	6,000	4/3/1	(173)	-7.12%
			819 Harrison Street North	4,944	6,900	4/3/1	(2514)	-103.46%
1109 N. Utah Street	2,430	4/3/1	5650 8th Rd North	2,603	6,000	4/3/1	(173)	-7.12%
			819 Harrison Street North	4,944	6,900	4/3/1	(2514)	-103.46%
1105 N. Sycamore Street	3,483	5/4/1	2235 Nottingham Street North	5,197	8,930	5/4/1	(1714)	-49.21%
			6606 29th Street North	6,088	10,005	5/4/1	(2605)	-74.79%
			2915 WestMoreland Street North	4,989	10,392	5/4/1	(1506)	-43.24%
2208 18th Street North	3,032	4/3/1	1817 North Bryan Street	4,730	5,500	4/3/2	(1698)	-56.00%
2544 N. Upland Street	3,750	5/4/1	2260 Vermont Street North	5,777	9,949	5/4/1	(2027)	-54.05%
			3004 Stuart Street North	5,482	11,247	5/4/1	(1732)	-46.19%
			2357 Filmore Street North	6,223	9,709	5/4/1	(2473)	-65.95%
6014 North 28th Street	5,922	5/4/1	6312 31st Street North	6,352	8,085	5/4/1	(430)	-7.26%
			5116 27th Street North	4,887	7,030	5/4/1	1035	17.48%
			5700 26th Street North	4,997	7,599	5/4/1	925	15.62%
6300 Washington Blvd	5,351	5/4/1	2235 Nottingham Street North	5,197	8,930	5/4/1	154	2.88%
			6606 29th Street North	6,088	10,005	5/4/1	(737)	-13.77%
			2915 WestMoreland Street North	4,989	10,392	5/4/1	362	6.77%
5803 North 16th Street	3,843	4/4/1	5215 11th Road North	5,134	6,875	4/3/1	(1291)	-33.59%
			5536 11th Road North	7,663	10,407	4/5/1	(3820)	-99.40%
			5542 11th Road North	6,290	10,796	4/4/1	(2447)	-63.67%
4620 S. 6th Street	3,864	4/3/1	3920 8th Street South	4,560	8,853	4/3/1	(696)	-18.01%
			35 Aberdeen Street	4,348	16,790	4/3/1	(484)	-12.53%
4700 S. 6th Street	4,430	5/4/1	3416 9th Street South	5,177	6,850	5/4/1	(747)	-16.86%
			4202 Arlington Blvd	5,493	9,048	5/4/1	(1063)	-24.00%
			4204 Arlington Blvd	5,643	8,313	5/4/1	(1213)	-27.38%
515 Lincoln Street North	4,999	6/5/0	3111 7th Street North	5,621	6,419	5/5/1	(622)	-12.44%
			512 Monroe Street North	5,177	5,270	5/5/1	(178)	-3.56%
4211 15th Street North	4,890	5/4/1	1822 Taylor Strret North	4,470	8,000	5/4/1	420	8.59%
			4357 Lee Highway	4,888	5,177	5/4/1	2	0.04%
			1736 Quebec Street North	4,576	6,791	5/4/1	314	6.42%

It should be noted, for the purpose of achieving comparable properties, there are some small differences in the comparison properties. Most of the properties have the

exact same bedroom/bathroom/half-bathroom mix. Nevertheless, to find enough quality comparison properties, the bedroom/bathroom/half-bathroom mix can be slightly different in some comparables. It should be also noted that there is a wide array of square foot differentials between the green homes and the comparable houses. Some houses were bigger and some were smaller. Arlington County does not have cookie cutter single family homes. For these reasons, there is more than one comparable home for each green home with the exception of one green home. The author believes that in totality, the comparisons are fair and reasonable.

THE VALUE OF GREEN RESIDENTIAL HOMES

PRICE ANALYSIS GREEN PROPERTY VS. NON-GREEN PROPERTY

Green Home(s)	Sale Price	Home Sq. Ft.	Dollars per Square Foot	Comparable Non-Green Home(s)	Sale Price	Home Sq. Ft.	Dollars per Square Foot	Price Difference	Price Percent Change	Sq. Ft Price Difference	Sq. Ft Price Percent Change
4215 15th Street North	$1,260,000	4,890	$257.67	1822 Taylor Strret North	$1,350,000	4,470	$ 302.01	(90,000.00)	-7.14%	$ (44.34)	-17.21%
				4357 Lee Highway	$815,000	4,888	$ 166.73	445,000.00	35.32%	$ 90.93	35.29%
				1736 Quebec Street North	$1,219,000	4,576	$ 266.39	41,000.00	3.25%	$ (8.72)	-3.38%
1107 N. Utah Street	$899,000	2,430	$369.96	5650 8th Rd North	$910,000	2,603	$ 349.60	(11,000.00)	-1.22%	$ 20.36	5.50%
				819 Harrison Street North	$1,150,000	4,944	$ 232.61	(251,000.00)	-27.92%	$ 137.35	37.13%
1109 N. Utah Street	$899,000	2,430	$369.96	5650 8th Rd North	$910,000	2,603	$ 349.60	(11,000.00)	-1.22%	$ 20.36	5.50%
				819 Harrison Street North	$1,150,000	4,944	$ 232.61	(251,000.00)	-27.92%	$ 137.35	37.13%
1105 N. Sycamore Street	$1,172,613	3,483	$336.67	2235 Nottingham Street North	$1,164,000	5,197	$ 223.98	8,613.00	0.73%	$ 112.69	33.47%
				6606 29th Street North	$1,644,900	6,088	$ 270.19	(472,287.00)	-40.28%	$ 66.48	19.75%
				2915 WestMoreland Street North	$860,000	4,989	$ 172.38	312,613.00	26.66%	$ 164.29	48.80%
2208 18th Street North	$1,377,000	3,032	$454.16	1817 North Bryan Street	$1,253,700	4,730	$ 265.05	123,300.00	8.95%	$ 189.10	41.64%
2544 N. Upland Street	$1,525,000	3,750	$406.67	2260 Vermont Street North	$1,602,578	5,777	$ 277.41	(77,578.00)	-5.09%	$ 129.26	31.79%
				3004 Stuart Street North	$1,360,000	5,482	$ 248.08	165,000.00	10.82%	$ 158.58	39.00%
				2357 Filmore Street North	$1,685,000	6,223	$ 270.77	(160,000.00)	-10.49%	$ 135.90	33.42%
6014 North 28th Street	$1,375,000	5,922	$232.19	6312 31st Street North	$1,512,500	6,352	$ 238.11	(137,500.00)	-10.00%	$ (5.93)	-2.55%
				5116 27th Street North	$1,299,000	4,887	$ 265.81	76,000.00	5.53%	$ (33.62)	-14.48%
				5700 26th Street North	$1,404,480	4,997	$ 281.06	(29,480.00)	-2.14%	$ (48.88)	-21.05%
6300 Washington Blvd	$1,250,000	5,351	$233.60	2235 Nottingham Street North	$1,164,000	5,197	$ 223.98	86,000.00	6.88%	$ 9.63	4.12%
				6606 29th Street North	$1,644,900	6,088	$ 270.19	(394,900.00)	-31.59%	$ (36.59)	-15.66%
				2915 WestMoreland Street North	$860,000	4,989	$ 172.38	390,000.00	31.20%	$ 61.22	26.21%
5803 North 16th Street	$1,175,000	3,843	$305.75	5215 11th Road North	$1,299,900	5,134	$ 253.19	(124,900.00)	-10.63%	$ 52.56	17.19%
				5536 11th Road North	$1,608,000	7,663	$ 209.84	(433,000.00)	-36.85%	$ 95.91	31.37%
				5542 11th Road North	$1,510,000	6,290	$ 240.06	(335,000.00)	-28.51%	$ 65.69	21.48%
4620 S. 6th Street	$1,425,965	3,864	$369.04	3920 8th Street South	$1,235,000	4,560	$ 270.83	190,965.00	13.39%	$ 98.21	26.61%
				35 Aberdeen Street	$947,000	4,348	$ 217.80	478,965.00	33.59%	$ 151.24	40.98%

4700 S. 6th Street	$1,320,901	4,430	$298.17	3416 9th Street South	$830,000	5,177	$ 160.32	490,901.00	37.16%	$ 137.85	46.23%
				4202 Arlington Blvd	$820,000	5,493	$ 149.28	500,901.00	37.92%	$ 148.89	49.93%
				4204 Arlington Blvd	$800,000	5,643	$ 141.77	520,901.00	39.44%	$ 156.40	52.45%
515 Lincoln Street North	$1,498,000	4,999	$299.66	3111 7th Street North	$1,400,000	5,621	$ 249.07	668,000.00	6.54%	$ 50.59	16.88%
				512 Monroe Street North	$1,400,000	5,177	$ 270.43	678,000.00	6.54%	$ (12.76)	9.76%
4211 15th Street North	$1,258,000	4,890	$257.26	1822 Taylor Strret North	$1,350,000	4,470	$ 302.01	(92,000.00)	-7.31%	$ (44.75)	-17.40%
				4357 Lee Highway	$815,000	4,888	$ 166.73	443,000.00	35.21%	$ 90.52	35.19%
				1736 Quebec Street North	$1,219,000	4,576	$ 266.39	39,000.00	3.10%	$ (9.13)	-3.55%

Average Price Difference	$	**84,470**
Average Sq. Ft. Price Difference	$	**68**
Median Price Difference	$	**39,000**
Median Sq. Ft. Price Difference	$	**66**
Standard Deviation Price	$	**320,694**
Standard Deviation Sq. Ft. Price	$	**74**
Average Percentage Difference		**2.85%**

Green homes did well on a simple total sales price breakdown. Ten of the thirteen homes had a better selling price than at least one of its comparables. The remaining three green homes were thoroughly beaten by the selling price of the conventional home.

The best price differential for non-green homes was $433,000. Alternatively, the green homes had the best overall price differential of $678,000. The average price difference of a green home versus the comparable conventional home was $84,470. Green homes also did better on an average price per square foot basis than their conventional comparables with an average of $68 per square foot.

Although the green homes have apparently beaten out their conventional counterparts in selling price, the simple numbers do not tell the total story. A more complete assessment of sale price success would be to include the average percentage.

When comparing the green homes with their comparables in average percentage, the green homes win with a differential of 2.85%. But a 2.85% average percentage difference does not bode well for the green home. As previously stated in this paper, sustainable development can increase the cost to build a house by an additional 2% to 6%. The question then becomes whether 2.85% is enough of a profit incentive for developers building green homes. I believe 2.85% is not a good enough profit. However, I also believe that because we are still in the infancy stages of sustainable construction that cost will go down and profits will increase over time. This is the incentive for developers to continue to build green homes event though the selling prices might not be where they would want them to be right now.

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Lastly, we will now address and compare the time on the market before sale for green homes against their comparables.

Green Home(s)	Date Sold	Date Certified Green	Time on Market After Green Certification	Days on Market	Comparable Non-Green Home(s)	Date Sold	Days on Market	DOM Difference
4215 15th Street North	Nov-09	Nov-09	Less Than 1 Month	42	1822 Taylor Strret North	Jul-09	291	-249
					4357 Lee Highway	Dec-09	619	-577
					1736 Quebec Street North	Dec-09	113	-71
1107 N. Utah Street	Dec-07	Dec-07	Less Than 1 Month	10	5650 8th Rd North	Dec-06	16	-6
					819 Harrison Street North	Nov-07	118	-108
1109 N. Utah Street	Dec-07	Dec-07	Less Than 1 Month	117	5650 8th Rd North	Dec-06	16	101
					819 Harrison Street North	Nov-07	118	-1
1105 N. Sycamore Street	Nov-08	Dec-08	Before Certification	56	2235 Nottingham Street North	Oct-07	131	-75
					6606 29th Street North	Oct-08	5	51
					2915 WestMoreland Street North	May-09	305	-249
2208 18th Street North	Nov-08	May-09	Before Certification	4	1817 North Bryan Street	Feb-08	245	-241
2544 N. Upland Street	Dec-07	Dec-07	Less Than 1 Month	5	2260 Vermont Street North	Apr-07	165	-160
					3004 Stuart Street North	Dec-07	395	-390
					2357 Filmore Street North	Dec-08	61	-56
6014 North 28th Street	Jun-09	Jun-08	12 Months	405	6312 31st Street North	Mar-08	102	303
					5116 27th Street North	Jul-09	36	369
					5700 26th Street North	Apr-10	60	345
6300 Washington Blvd	Jun-08	May-08	1 Month	429	2235 Nottingham Street North	Oct-07	131	298
					6606 29th Street North	Oct-08	5	424
					2915 WestMoreland Street North	May-09	305	124
5803 North 16th Street	Jul-09	Oct-08	9 Months	83	5215 11th Road North	Oct-07	425	-342
					5536 11th Road North	Jun-09	324	-241
					5542 11th Road North	Aug-09	53	30
4620 S. 6th Street	Jun-07	Jun-07	Less Than 1 Month	81	3920 8th Street South	Feb-07	97	-16
					35 Aberdeen Street	Dec-06	82	-1
4700 S. 6th Street	Jul-07	Jun-07	Less Than 1 Month	77	3416 9th Street South	Dec-08	497	-420
					4202 Arlington Blvd	May-09	448	-371
					4204 Arlington Blvd	Sep-09	554	-477
515 Lincoln Street North	Mar-10	Sep-09	Six Months	111	3111 7th Street North	Dec-08	95	16
					512 Monroe Street North	Jul-07	297	-186
4211 15th Street North	Dec-09	Nov-09	1 Month	26	1822 Taylor Strret North	Jul-09	291	-265
					4357 Lee Highway	Dec-09	619	-593
					1736 Quebec Street North	Dec-09	113	-87
Average DOM				**111**			**216**	

Similarly to the total sales price breakdown, the green homes were successful in winning the time on the market analysis. Eleven of the thirteen homes had fewer days on the market than at least one of its comparables. Most of time was significantly less than the comparable. The remaining two green homes were much longer on the market than any of their conventional counterparts.

The longest time on market was 619 days for a conventional home and 429 days for a sustainable home. What's more, the green homes collectively had much less time on the market than their comparables.

Again, this analysis seems like a clear win for the green homes just like the sale price analysis. But just like the sales price analysis there is a critical aspect that must be addressed. Green homes have a decided advantage in time on the market sales because green homes are advertised and marketed long before being actually put on any listing. This is why it was important to list and study both the Date Certified Green and Time on Market After Green Certification columns.

After examining these columns the time on the market analysis will be viewed differently. Some of the apparent wins by the green homes were not truly fair. The green homes were marketed long before being put on a sales listing. The very nature of going through the green certification put the property on the radar of potential buyers wanting sustainable housing.

Without the properties being put on an equal marketing basis there can be no final conclusion of whether the green homes have an advantage in being sold more quickly after being listed.

COMPARATIVE STUDIES

In this section two other studies, which covered green home value versus conventional home value, will be examined. Thereafter, the finding will be compared or contrasted with this study.

The first study was conducted in Atlanta, Georgia (Matthews, 2009). This study observed single family homes which were built in 2007 or later in the counties of Fulton, Dekalb, Cobb and Gwinnett. All the properties were sold as new construction and sold for prices between $250,000 and $2,000,000. 94 green homes and 1305 conventional homes provided the data in this study.

This study found that conventional houses sold for $10,000 more than the green home. However, the green homes sold at higher percentage of list price to sale price. Moreover, the green properties spent 10 less days on the market the conventional counterparts.

The second study was conducted in the state of Washington within the Portland and Seattle metropolitan areas (Griffin, 2009). The Portland portion of the study observed 92 green homes and 340 comparables while the Seattle portion observed 68 green homes and 207 comparables.

This study concluded that green certified homes are worth more. The basis of this conclusion was that for the Portland part green certified homes sold 18 days faster than conventional homes and green certified homes sold for 3% to 5% more than conventional homes. Further, for the Seattle part the expected percentage change for sales price was found to be 9.6% more for the sustainable certified homes. On the other hand, the Seattle part also found that the green certified homes did not sell faster,

and stayed on the market an average of 5 days longer (or 40% more time on the market).

Both of these studies were similar to my study in that there was evidence for both sides of the argument of whether newly constructed green homes have more value than conventional homes. Notwithstanding this, the Washington State study concluded that green homes are worth more.

CONCLUSION

To review, this paper has examined green/sustainable residential single family homes and tried to address the question of what is the value of a green residential home product.

To do this the following was examined, analyzed and/or discussed:

- the history of the green/sustainable housing movement;
- the total single family home market compared with single family green portion of that market;
- the three biggest national rating systems, Energy Star, Leed for Homes, and NAHB;
- the reasons to change to a sustainable living and to a green house;
- the warts and problems with the construction, materials, costs, and health issues of building green;
- the housing market both nationally and regionally;
- the demographics of Arlington County, Virginia, the main area of my study;
- comparison of newly built single family homes that are certified green in Arlington with comparable newly built non-green single family homes;
- the results of two other studies done in my done in Atlanta and in the State of Washington in both the Portland and Seattle metropolitan areas.

As a result of this examination, analysis and/or discussion this paper will conclude that although the green/sustainable movement is growing tremendously and the future looks bright at the present there is no greater value in newly built green residential single family homes. There is no irrefutable or conclusive evidence that at present the green homes consistently give more value, whether in price, time on the market or performance.

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